UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/079,855	02/22/2002	Osamu Komuro	N9450.0046/P046	7580

24998 7590 12/05/2003

DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP
2101 L STREET NW
WASHINGTON, DC 20037-1526

EXAMINER	
QUASH, ANTHONY G	
ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 12/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/079,855	KOMURO ET AL.
	Examiner	Art Unit
	Anthony Quash	2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 8/11/03.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-6 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-6 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Applicants' amendment, dated 8/11/03 has overcome the 112 rejections in last office action, dated 5/9/03.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-6, to the extent understood, remain rejected under 35 U.S.C. 103(a) as being unpatentable over Archie [273] in view of Ausschnitt [578]. As per claims 1, 3, Archie [273] teaches a process conditions change monitoring system for monitoring changes in exposure and focus conditions by use of electron beam images of the resist patterns, comprising detecting images of resist patterns by using electron beams, detecting dimensional characteristic quantities including edge widths and/or pattern widths of the resist, storing models for establishing logical linking between exposure conditions and dimensional characteristic quantities, and calculating changes in exposure and focus conditions by applying, to the models, those dimensional characteristic quantities. See Archie [273] abstract, figs. 1-4,6A-7, col. 2 lines 1-35, 53-65, columns 3-5, and col. 9 lines 20-67. However, Archie [273] does not specifically teach a dimensional characteristic quantity detection means by which the respective

dimensional characteristic quantities of a first pattern portion and a second pattern portion different from one another in the tendency of the changes in dimension characteristic quantities. Archie [273] does however; teach measuring a plurality of dimensions. See Archie [273] col. 3 lines 30-67. In addition, Ausschnitt [578] does teach a dimensional characteristic quantity detection means by which the respective dimensional characteristic quantities of a first pattern portion and a second pattern portion different from one another in the tendency of the changes in dimension characteristic quantities. See Ausschnitt [578] col. 1 lines 20-67, col. 3 lines 35-67, and col. 4 lines 1-65, col. 5 lines 20-67, and col. 6 lines 1-45. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have a dimensional characteristic quantity detection means by which the respective dimensional characteristic quantities of a first pattern portion and a second pattern portion different from one another in the tendency of the changes in dimension characteristic quantities in order to aid in providing the correct focus to the beam and the correct exposure dosage of the beam to the substrate so as to aid in the manufacturing of microelectronic devices as taught in Ausschnitt [578]. With respect to the applicants' claims regarding an image detection unit, memory, and a calculating unit, both Archie [273] and Ausschnitt [578] teach that the detection and imaging means be provided by a SEM (scanning electron microscopy). See Archie [273] col. 3 lines 5-65, col. 4 lines 1-15, 45-60 and col. 5 lines 1-35. Also see Ausschnitt [578] col. 1 lines 20-67, col. 2 lines 1-15. It is well known in the art that SEM's contain imaging detection means by use of a detector for detecting secondary particles from an object. With

respect to the applicants' claim for memory and a calculating unit, Archie [273] specifically teaches the use a processor for programming and the installation of software. See Archie [273] col. 4 lines 45-58. It is well known that processor that can be programmed contain memory and calculating means. In addition, Watanabe [637] is presented as an example of an SEM device that contained the electron beam image detection means, calculation unit, etc. as discussed above.

As per claims 2,4, Ausschnitt [578] teaches correcting exposure conditions according to changes in exposure conditions along with establishing a logical link between exposure levels and dimensional characteristic quantities. See Ausschnitt [578] col. 3 lines 35-67 and col. 4 lines 5-60. Also see Archie [273] col. 4 lines 1-30.

As per claim 5, Ausschnitt [578] teaches correcting the focus according to changes in the focus that have been calculated. See Ausschnitt [578] col. 4 lines 5-40.

As per claim 6, Ausschnitt [578] teaches calculating tolerances on focus deviations and on exposure energy changes. See Ausschnitt [578] col. 4 lines 15-37.

Response to Arguments

Applicant's arguments filed 8/11/03 have been fully considered but they are not persuasive. With respect to the applicants' argument concerning Ausschnitt [578] not teaching the inspection device being a scanning electron microscope, it is the examiners view that Ausschnitt [578] does teach this. This is made evident when Ausschnitt [578] states that evaluation and measurement of the shapes (which includes the edges and widths) and spaces may be made with an optical microscopy (for latent

images) or optical or scanning electron microscopy (for developed images). See Ausschnitt [578] col. 20 lines 13-20.

With respect to the applicants' argument concerning Ausschnitt [578] not teaching a monitoring system of a scanning electronic type microscope, Ausschnitt [578] teaches that it is well known to monitor pattern features using a scanning electron microscope. This is made evident when Ausschnitt [578] states that; "Monitoring of pattern features and measurement of its dimensions (metrology) is typically performed using either a scanning electron microscope (SEM) or an optical tool. Current practice in the semiconductor industry is to use top-down SEMs for the in-line metrology of all critical dimensions ...." See Ausschnitt [578] col. 1 lines 65-67 and col. 2 lines 1-3.

With respect to the applicants' argument concerning Ausschnitt [578] not teaching the dimensional characteristic quantity detection means detecting changes in the edge widths and/or pattern widths of the resist patterns against changes in exposure conditions, it is the examiner's view that Ausschnitt [578] does teach this. This is made evident when Ausschnitt [578] states, "... exposing a plurality of a first set of complementary tone patterns onto a resist film layer having a resist threshold disposed on a substrate, each of the first set of complementary tone patterns comprising: i) a first pattern portion having a shape which corresponds to an area on the resist film having an exposure dose below the resist threshold of the resist film and ii) a second pattern portion having a space which corresponds to an area on the resist film having an exposure dose above the resist threshold of the resist film, the shape and space having corresponding dimensions, each of the exposed first set of complementary tone

patterns being exposed on the resist film under **different** focus or exposure conditions; measuring the dimensions of image shapes and spaces on each of the exposed first stet of complementary tone patterns; determining optimum focus or exposure dose conditions based on the measurements ... determining the dependence of focus or exposure dose conditions on the dimensions of the image shapes and spaces ...." See Ausschnitt [578] col. 5 lines 45-67. Ausschnitt [578] also goes on to teach perform the above for one or more of a second set of complementary tone patterns on a resist film. See Ausschnitt [578] col. 6 lines 1-20. Also see Ausschnitt [578] abstract, col. 1 lines 20-67, col. 2 lines 1-4,42-45, col. 3 lines 15-20, 35-67, col. 4 liens 9-40, 49-64, col. 5 lines 5-27,44-67, col. 6 lines 1-10,14-18,50-67, col. 7 lines 1-46, col. 8 lines 1-50, col. 10 lines 40-57, col. 13 lines 50-54, col. 20 lines 13-20, col. 27 lines 23-67, col. 29 lines 10-60, and col. 42 lines 25-30. By exposing, measuring, and determining the shapes and spaces under different focus and exposure conditions, one is in essence detecting the respective dimensional characteristic quantities of the edge widths of a first pattern portion and a second pattern portion, which are different form another in the tendency of the changes in the dimensional characteristic quantities of the edge widths of the resist patterns against changes in focus value and exposure conditions. This is because the shapes and spaces correspond to the widths/edge-widths of the patterns.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent Nos. 5,109,430 to Nishihara et al, 2003/0010912 to Archie, and 5,790,254 to Ausschnitt are considered pertinent to the applicants' disclosure. Nishihara [430] is considered pertinent because of its discussion on a mask alignment and measurement of critical dimensions in integrated circuits. Archie [2003/0010912] is considered pertinent because of its discussion on a methodology for critical dimension metrology using stepper focus monitor information. It also teaches a method for monitoring critical dimensions using a scanning electron microscope. Ausschnitt [254] is considered pertinent because of its discussion on monitoring of minimum features on a substrate.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Quash whose telephone number is (703)-308-6555. The examiner can normally be reached on M-F from 9 a.m. to 5 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee, can be reached on (703)-308-4116. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-308-0956.

A. Quash 11/20/03